APPLICATION FOR MODIFICATION OF EXPERIMENTAL AUTHORITY

ThinKom Solutions, Inc. ("ThinKom") hereby files this application to modify its existing experimental authority (Call Sign WE2XLJ; File No. 0347-EX-PL-2007) for testing and demonstration of land mobile-satellite service ("LMSS") terminals operating in the Ku-band (14.0-14.5 GHz transmit; 11.7-12.2 GHz receive). Specifically, ThinKom seeks to extend its experimental authority to operate its presently authorized terminals, as well as add an additional antenna type (the ThinSAT®300), for a period of two years from the grant of the modification application. In addition, ThinKom seeks to modify certain technical characteristics of the terminals and add new satellite points of communication to its experimental authority.

Consistent with the Commission's experimental licensing rules, ThinKom also seeks authority to provide service pursuant to government contract and conduct limited market studies with the authorized antennas. ThinKom intends to file for standard blanket license authority from the International Bureau for full commercial implementation of its proposed system later this year once service rules for vehicle-mounted earth stations ("VMESs") are adopted. In the near term, however, ThinKom seeks to serve a significant U.S. government customer and conduct limited market studies given the early stage of development of its network and commercial Ku-band land mobile broadband operations generally.

The proposed modifications set forth herein are consistent with the Commission's experimental licensing rules and the analogous earth stations onboard vessels ("ESV") licensing rules, including two-degree spacing policies and rules designed to protect co-frequency government space research and radio astronomy operations. As a result and given the pressing need of certain U.S. government agencies to operate with the new antenna, as well as the ongoing need for development of previously authorized antennas, ThinKom seeks expedited treatment for this modification application. As described herein, the public interest would be strongly served by grant of this application.

I. BACKGROUND

ThinKom is a California-based developer of new antenna technologies and products for a wide variety of applications and locations. ThinKom has developed a line of ultra low-profile, broadband, highly efficient and affordable antenna systems for "Comm-on-the-Move" ("COTM") applications based on the patented continuous transverse stub ("CTS") technology and variable inclination continuous transverse stub ("VICTS") technology. These systems will automatically search for and acquire the designated satellite and maintain precise pointing via automatic control of azimuth, elevation and polarization angles.

On November 2, 2007, the Commission granted experimental authority (Call Sign WE2XLJ) to ThinKom to conduct testing and demonstration activities for a two-year period, until November 1, 2009, for two LMSS terminal types, one using the CTS technology (antenna system TKS-GMTR6x24) and a second using the VICTS technology (antenna system TKS-GMT21R16), in the Ku-band. ThinKom indicated that it planned to deploy up to 25 terminals under the experimental authorization.

On March 2, 2009, ThinKom notified the Commission that it would begin testing an additional Ku-band LMSS terminal not specifically included in Call Sign WE2XLJ: the ThinSAT®300 terminal, also based on the VICTS technology. Consistent with the operations of the two previously authorized antenna types, ThinKom further advised that it planned to deploy up to 25 ThinSAT®300 antennas.

ThinKom now seeks formal experimental license authority to operate up to 25 terminals of each of the three antenna types pursuant to conditions similar to those set forth in its original experimental license to conduct additional testing and demonstrations of its LMSS terminals. There has been strong interest in the antennas by potential customers for a variety of COTM applications -- including national security, disaster recovery and emergency services -- that can be supported by these devices. ThinKom has received inquiries from dozens of companies, as well as U.S. government agencies and military units, for its existing antennas and the new ThinSAT®300 terminal.

II. REQUEST FOR EXTENSION OF EXPERIMENTAL AUTHORITY

ThinKom seeks to extend the term of its experimental authority under Call Sign WE2XLJ for an additional two years from the date of grant of this application. This will allow ThinKom to further test and demonstrate its terminals, including the new antenna model, under modified operating conditions outside a lab environment. In addition, it will allow ThinKom to provide limited service pursuant to government contracts (*see* Section V), and conduct limited market studies (see Section VI) in furtherance of its advanced mobile broadband offering.

Regarding the currently authorized antenna types, with the exception of the modified operating parameters discussed herein (namely, establishing transmit power levels based on the geographic location of the terminals and the orbital location of the serving satellite), ThinKom hereby incorporates by reference the technical information provided in the original experimental license application, including the supplemental filing demonstrating compliance with Section 25.222 (47 C.F.R. § 25.222) dated October 26, 2007. Except as modified in Section III.C, *infra*, ThinKom acknowledges and accepts the conditions set forth in its existing experimental license with respect to the technical and operational requirements associated with its currently authorized terminals. Relevant information regarding the new antenna type is also set forth below.

III. ADDITIONAL ANTENNA TYPE AND OPERATING PARAMETERS

A. ThinSAT®300 - General Technical Information

The ThinSAT®300 terminal uses a pair of VICTS antennas and is designed to be mounted on a broad range of vehicles, including HMMVWs, trains and emergency response vehicles. The full-motion tracking system allows broadband connectivity on-the-move and the terminal can be used in many communications applications, including high-speed Internet access to vehicle passengers, backhaul for a mobile cellular or WiMax network surrounding the vehicle, and video backhaul for satellite news-gathering. The antenna is easily mounted and is built to withstand rugged operating conditions. (A copy of the ThinKom product brochure for the ThinSAT®300 is included as Attachment 1.)

The ThinSAT®300 consists primarily of two antennas (30" transmit and 20" receive with integrated LNB), the antenna control unit ("ACU") and a 40W amplifier/block upconverter ("BUC").

Figure 1: ThinSAT®300 Components

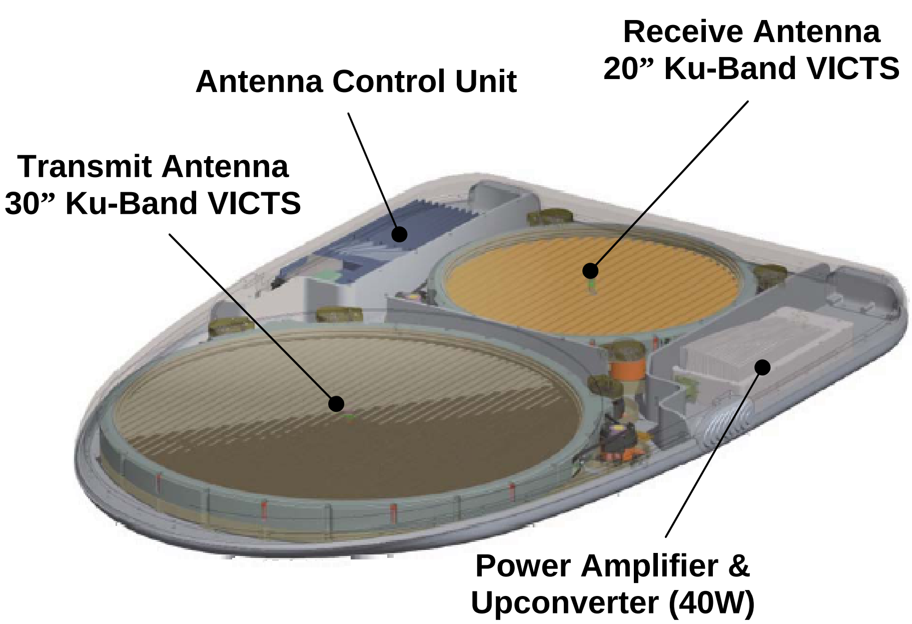

Table 1, below, provides key information regarding the physical and technical characteristics of the ThinSAT®300:

Table 1: ThinSAT®300 Technical and Other Data

Mounting Footprint	59"L x 39"W
Height (including radome)	4.5" H
Antenna Type	Dual-VICTS
Max. Transmit EIRP **G/T**	46-51 dBW (20°-70° EL) 7.5-12.7 dBi/K (20°-70° EL)
Half-Power Beamwidth	1.8º - 2.5º (depending on elevation angle and skew angle)
Cross-Pol Isolation **Scan Range**	> 30 dB (Typical) 15º - 85º Elevation
Antenna Controller/Tracking **Tracking Agility**	Integrated (Closed-Loop), better than 0.2º pointing accuracy; tracking speed > 120º/sec; acceleration > 120º/sec^2

B. ThinSAT®300 - General Operating Characteristics

The operating characteristics of the ThinSAT®300 are consistent with the requirements necessary to protect co-frequency FSS satellite operations from harmful interference, in particular:

- Maintaining a pointing error of less than 0.2° between the orbital location of the target satellite and the axis of the main lobe of the earth station antenna;
- Automatically terminating all emissions from the earth station within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the earth station antenna exceeds 0.5°, and transmission will not resume until such angle is less than 0.2°; and
- Compliance with the EIRP density criteria set forth in Section 25.222(a)(1) through (a)(4) of the Commission's Rules (47 C.F.R. § 25.222(a)(1) - (a)(4)).

Compliance with these fundamental conditions is described below.

Pointing Accuracy. The ThinSAT®300 consists of two antennas (one 30" transmit and one 20" receive) mounted to a common baseplate. The 20" receive antenna is used to acquire and track the satellite. Information is provided using GPS coordinates and three base mounted gyros to initially point the antenna and acquire the satellite downlink signal. The transmit antenna is prevented from transmitting until the receive antenna has acquired satellite lock and pointing accuracy is within required parameters.

In this connection, the receive beam is continuously con-scanned to keep the signal peaked and to enhance the accuracy provided by the base-mounted gyros. The carrier signal strength is tracked using a tunable narrowband filter and an envelope power detector. The 30" transmit antenna is slaved to the receive antenna pointing angles, but it does not con-scan and thus remains pointed directly at the satellite (*i.e.*, the center angle within the con-scan).

The ThinSAT® antenna pointing control is highly accurate and all the factors potentially affecting pointing accuracy are accounted for in setting maximum transmit power. The antennas are belt driven by a motor/encoder/Hall-effect home sensor system which provides better than 0.01° pointing accuracy for each antenna relative to the common base plate. The honey-combed baseplate structure and radome come together to form a rigid enclosure which even under the worst case operational vibration levels maintains the angular alignment of the Tx antenna to the Rx antenna to within 0.06°. The pointing angles of the Tx antenna are carefully and precisely calibrated to the pointing angles of the Rx antenna using ThinKom's in-house quasi-far-field range. After calibration, the accuracy of the relationship between the Tx and Rx antennas is good to 0.03°. During operation, the Rx antenna is continually con-scanned to keep it peaked on the satellite of interest. This allows the optimum pointing angle to the intended satellite to be determined to within 0.04°. This optimum pointing information forms the basis of the pointing command to the Tx antenna.

The Rx antenna conscan is also used to take out the drift of the base-mounted gyros which provide the correction commands to keep the LOS inertially stabilized. Under worst case base motion, the residual gyro noise and drift can cause the pointing angle to the intended satellite to be off by up to 0.10°.

Finally, the presence of an adjacent satellite transmitting in the same tight frequency band causes the Rx signal strength, as measured by ThinKom's Narrow-band RSSI circuit, to be peaked when the Rx antenna is pointed slightly towards the neighboring satellite. This effect is countered by using Eb/No information, provided by the modem, which, in this situation, will have a peak value when pointed slightly away from the neighboring satellite. After correction, the residual effect is a pointing uncertainty to the satellite of interest of 0.04°.

These sources of potential pointing variability when the route sum squared together results in a total pointing error of 0.14° for the transmit antenna satisfies the 0.2° pointing accuracy requirement established in the Commission's analogous ESV rules. However, if the onboard software indicates that either antenna is more than 0.5° from its intended orientation or that the receive signal has dropped, the antenna controller will issue a transmit mute command to cease transmit operations within 50 msec.

Notwithstanding compliant pointing accuracy and cessation of emissions characteristics, out of an abundance of caution, ThinKom will include additional margin with respect to off-axis EIRP spectral density by assuming a pointing offset of 0.2° when setting maximum transmit power levels while the terminal is in motion. In other words, the maximum transmit power of the ThinSAT®300 will be reduced by an amount equal to that necessary to maintain compliance with the off-axis EIRP mask in Section 25.222 assuming the antenna is mispointed by 0.2°, rather than assuming perfect pointing as permitted by the rules. This conservative approach will ensure that there is no potential for harmful interference from ThinKom's limited experimental operations.

Figures 2 and 3 depict off-axis EIRP spectral density of the ThinSAT®300, which complies with Section 25.222.

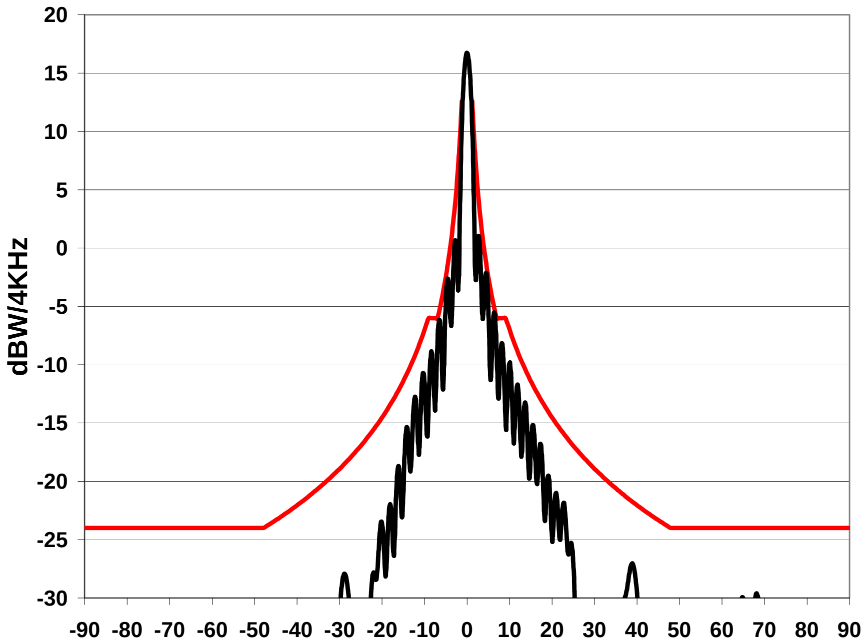

Figure 2: Off-Axis EIRP Spectral Density (+/-90 Deg.)

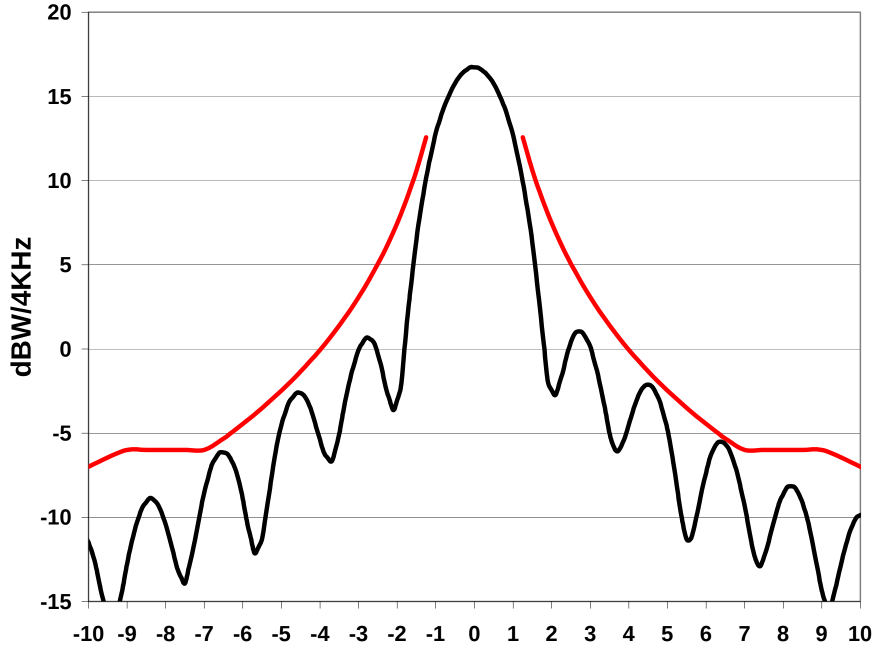

Figure 3: Off-Axis EIRP Spectral Density (+/- 10 Deg.)

These graphs show a simulated azimuth plane antenna pattern compared to the EIRP spectral density mask found in Section 25.222, and indicate that the ThinSAT®300 can radiate at a maximum of 16.8 dBW/4 kHz while maintaining compliance with Section 25.222.[1] The specific patterns shown in the two graphs above correspond to where the satellite is at a 45° elevation angle and the skew angle between the GSO plane and local horizontal is 15°.

Figure 4, below, is a further illustration of the maximum EIRP spectral density (in dBW/4 kHz) that the ThinSAT®300 can radiate while maintaining compliance with Rule 25.222. To be more specific, it shows the maximum compliant EIRP spectral density as a function of the latitude and longitude offset of the ThinSAT®300 (Earth Station) relative to the satellite.

[1] Attachment 2 is a chart of representative transmit emission designators and related information for the ThinSAT®300.

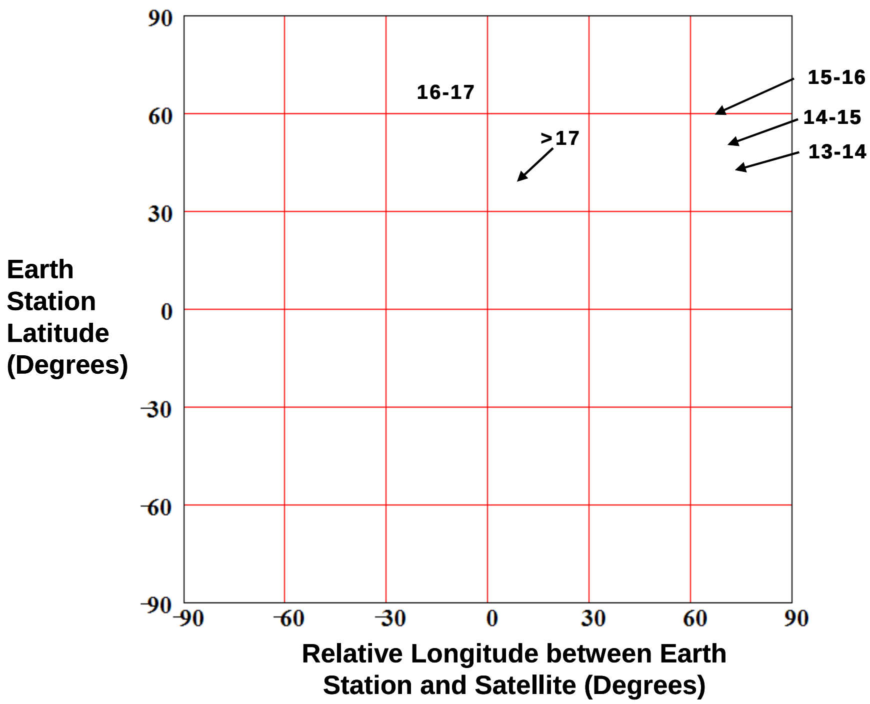

Figure 4: Maximum Off-Axis EIRP Spectral Density that the ThinSat 300 can radiate while maintaining compliance with FCC 25.222.

The following Figures 5 to 12 show the off-axis EIRP in the GSO plane for four different elevation angles (60°, 45°, 30°, 20°) of the satellite above the horizon that the antenna beam is pointed toward.

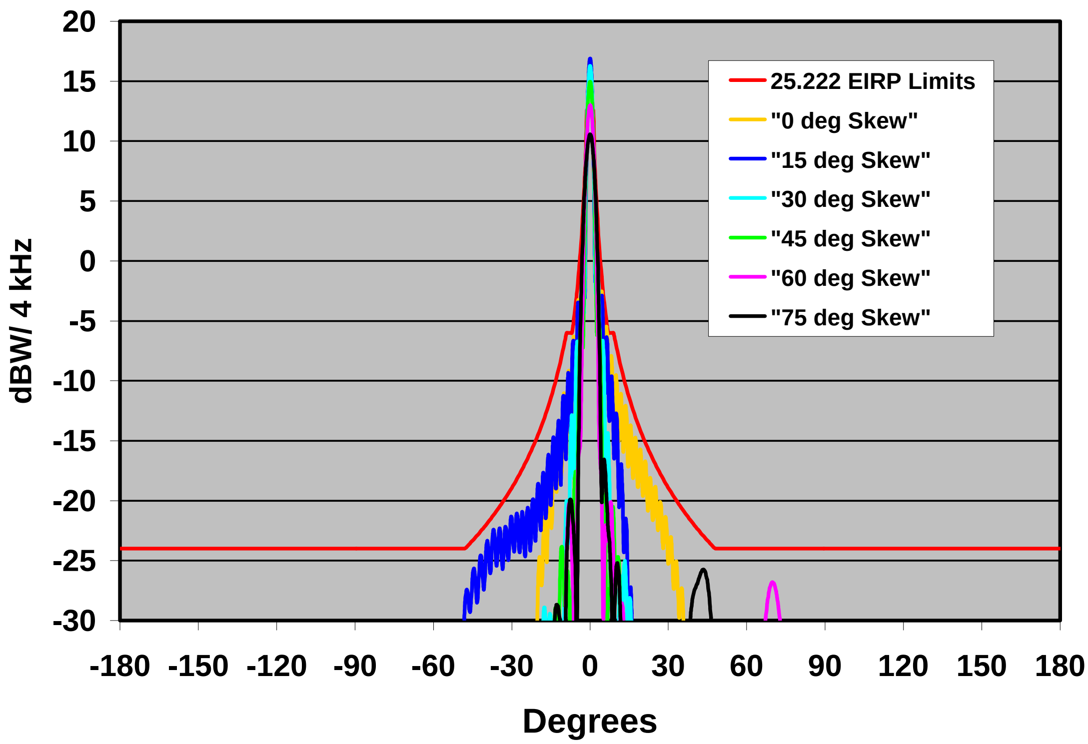

Figure 5: Geo-plane patterns at 14.25 GHz for the Satellite 60 degrees above the horizon for various skew angles.

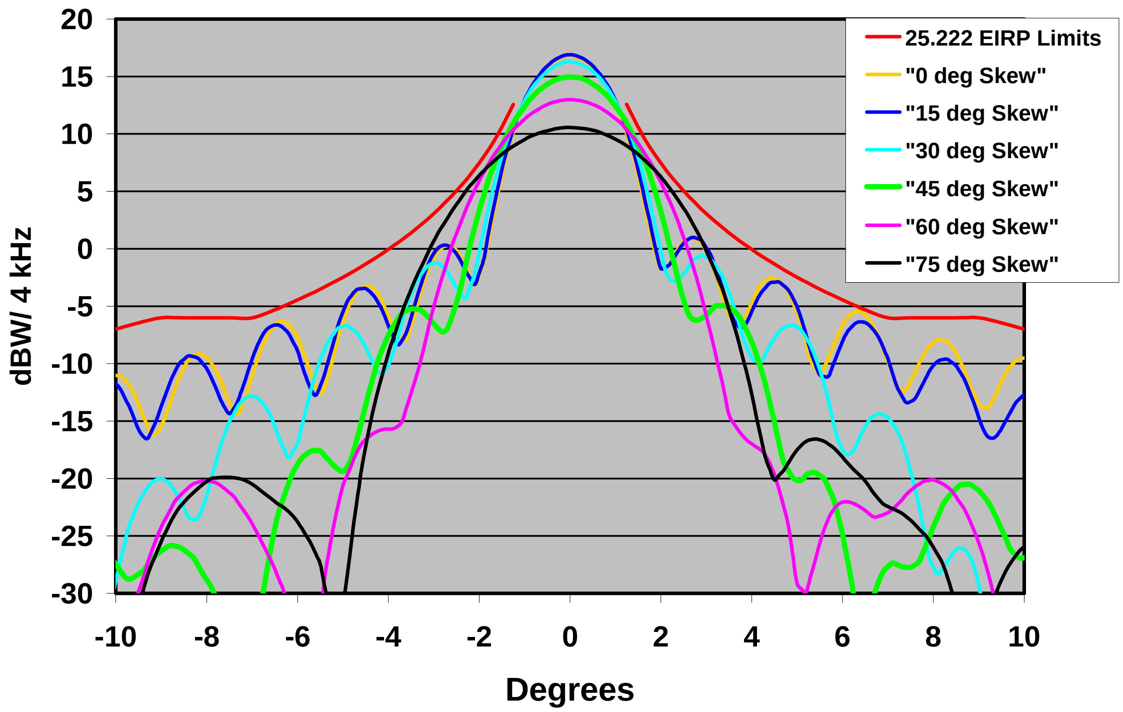

Figure 6: Geo-plane patterns at 14.25 GHz for the Satellite 60 degrees above the horizon for various skew angles.

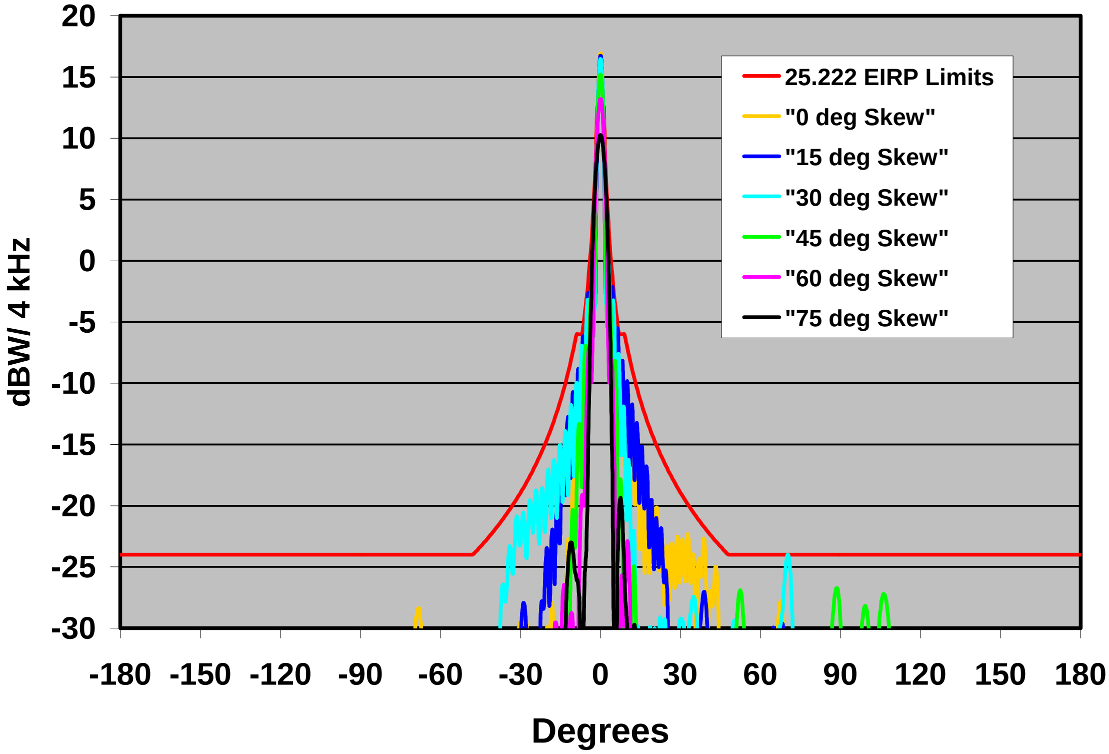

Figure 7: Geo-plane patterns at 14.25 GHz for the Satellite 45 degrees above the horizon for various skew angles.

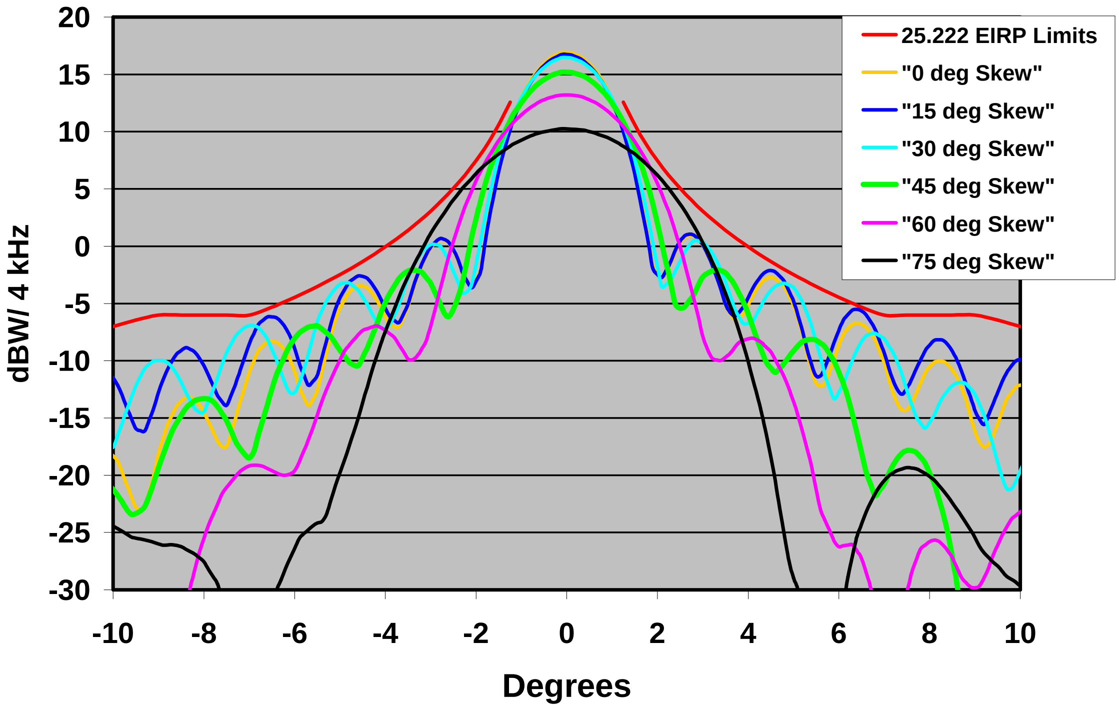

Figure 8: Geo-plane patterns at 14.25 GHz for the Satellite 45 degrees above the horizon for various skew angles.

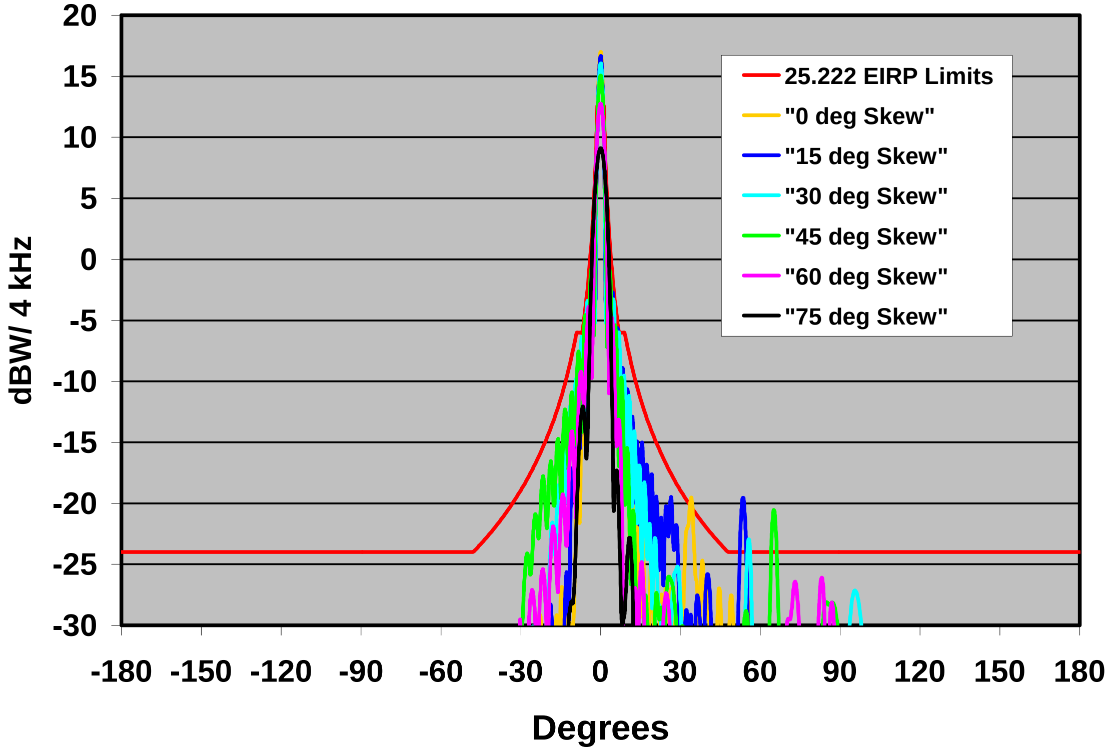

Figure 9: Geo-plane patterns at 14.25 GHz for the Satellite 30 degrees above the horizon for various skew angles.

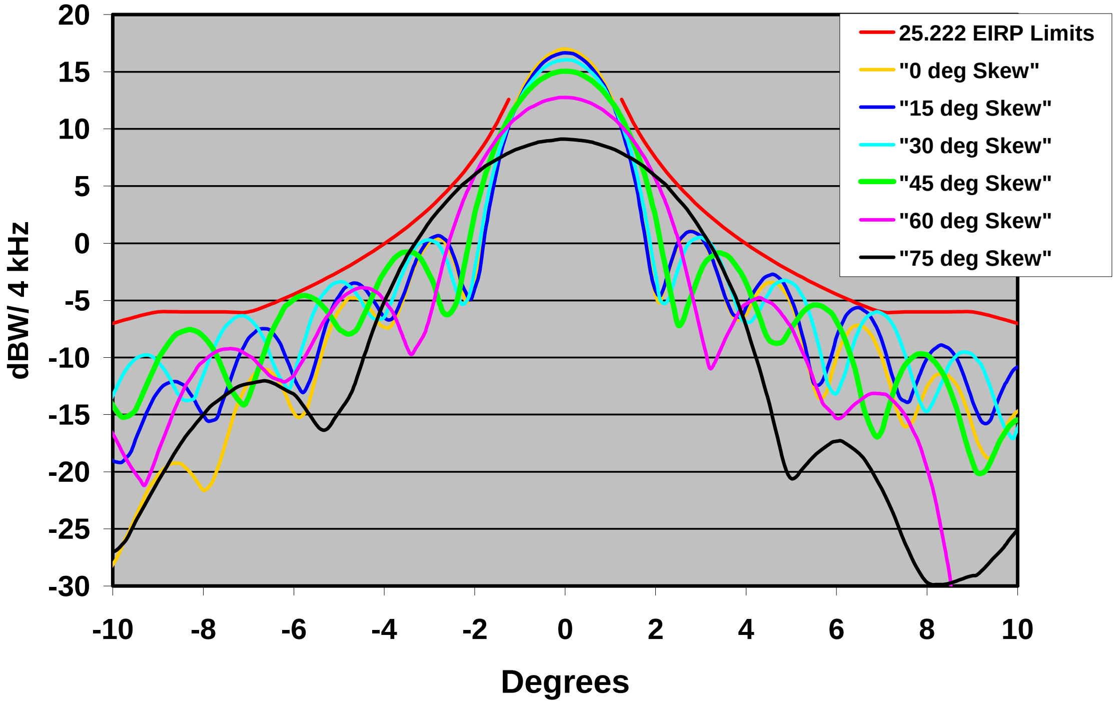

Figure 10: Geo-plane patterns at 14.25 GHz for the Satellite 30 degrees above the horizon for various skew angles.

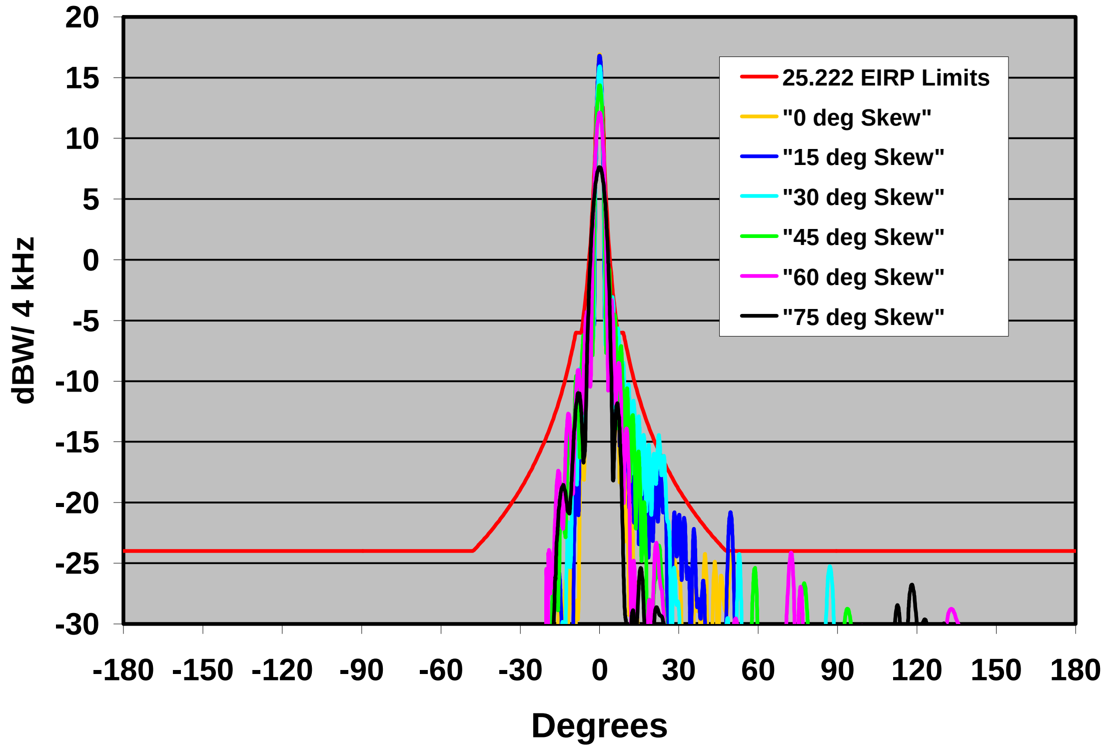

Figure 11: Geo-plane patterns at 14.25 GHz for the Satellite 20 degrees above the horizon for various skew angles.

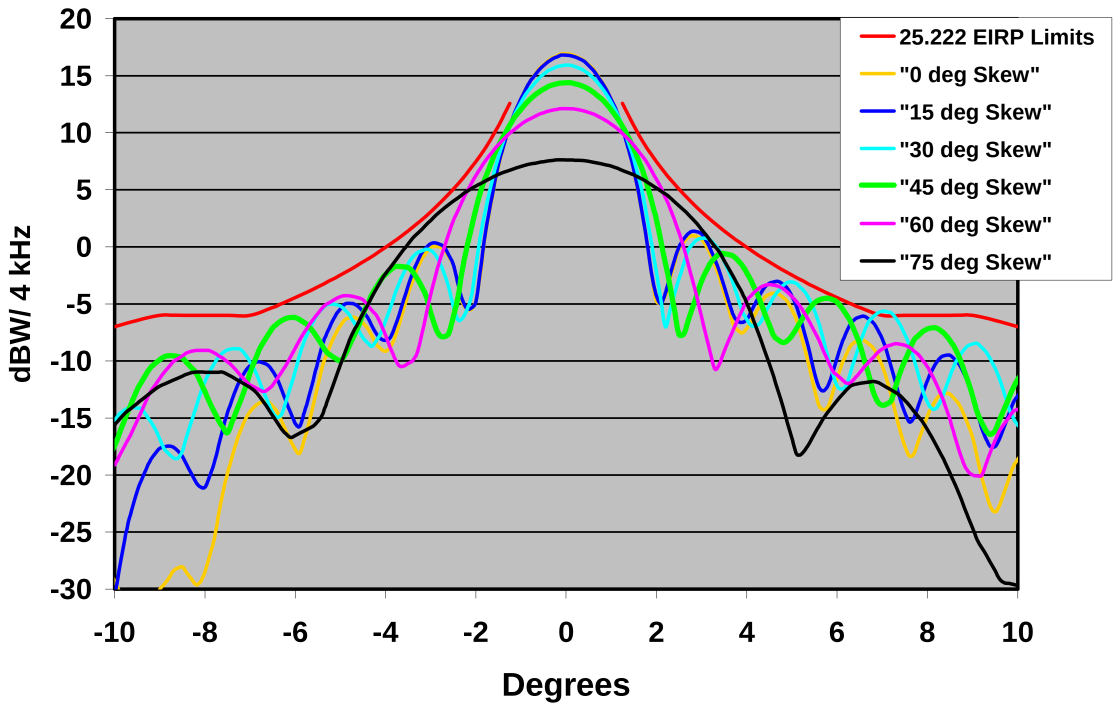

Figure 12: Geo-plane patterns at 14.25 GHz for the Satellite 20 degrees above the horizon for various skew angles.

Power Control. As is the case for any asymmetric antenna, the beamwidth of a ThinSAT®300 VICTS antenna in the GSO plane depends on the beamwidths in its principle axes, as well as the orientation of the antenna with respect to the GSO plane. The shape of the main beam radiated by a VICTS antenna changes as the scan angle is changed (*i.e.*, the beam becomes broader in the elevation plane as it is scanned away from boresight). The GSO-plane beamwidth depends on the combined effect of the variation in elevation beam width and the angle at which the GSO plane cuts through the beam, which is a deterministic function of the earth station latitude and the longitudinal offset between the earth station and the satellite, as well as the orientation of the ThinSAT®300 antenna.

The first map in Figure 13 shows the transmit (14.25 GHz) GSO plane beamwidth of the ThinSAT®300 when operating with a satellite located at 93º W from various locations in the continental United States (CONUS). The second map in Figure 13 shows the maximum (25.222

compliant) EIRP spectral density when operating with a satellite at 93º W. As noted above, the values conservatively assume a pointing error of 0.2°. The values range from about 16.2 dBW/4 kHz to just over 17 dBW/4 kHz. Note that 93º W was chosen as an example and that similar maps for operation with other satellites can be provided upon request.

Geo-Plane Beam Width:

Maximum Power Spectral Density (dBW/4KHz):

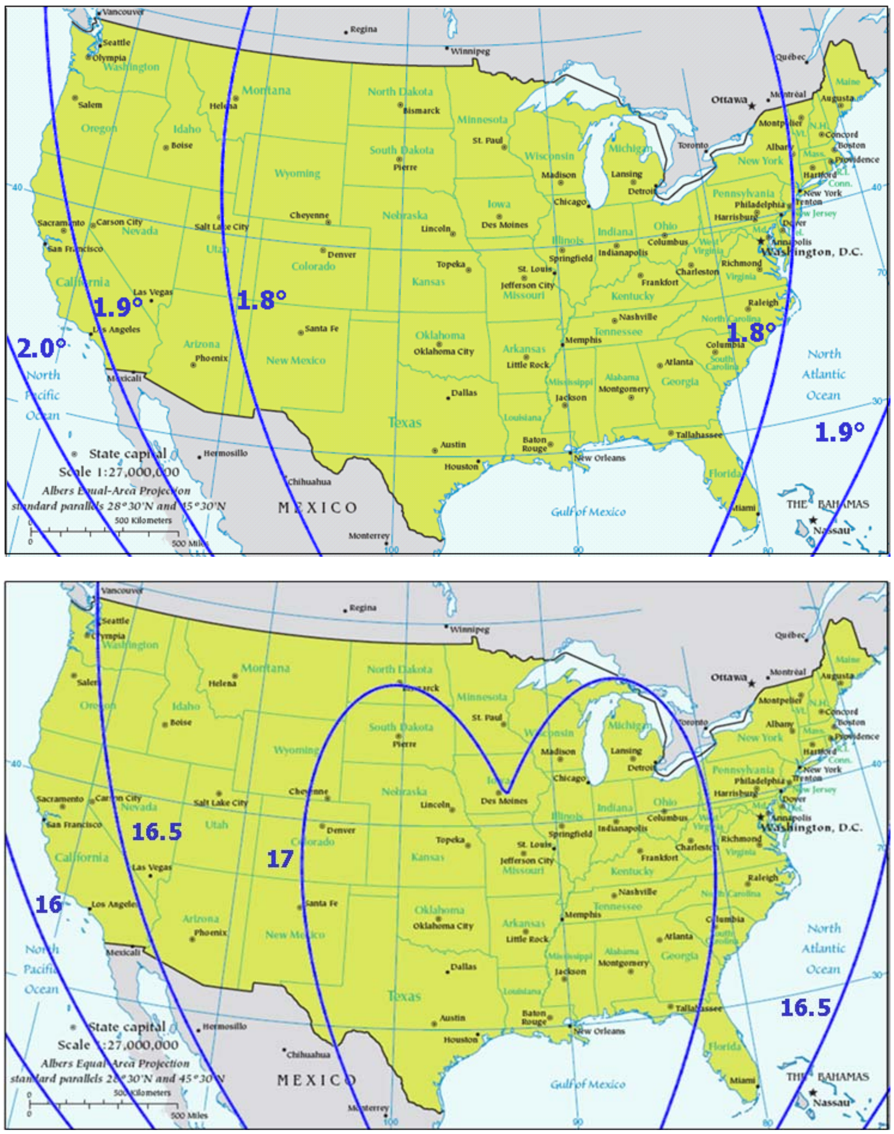

Figure 13: GSO Plane Beamwidth and Maximum Power Spectral Density at 14.25 GHz for ThinSat 300 Operating with Satellite at 93º W

The effect of vehicle tilt on GSO-plane beamwidth is typically very small. Figure 14 shows GSO-plane beamwidth and maximum (25.222 compliant) EIRP spectral density for CONUS operation with a satellite at 93º W for a vehicle tilted by 10 degrees westward (17.6% grade). As can be seen in the figure, this leads to a smaller beamwidth and a greater maximum EIRP spectral density for locations to the East of the satellite and a greater beam width and a smaller maximum EIRP spectral density for locations to the west of the satellite. The change in beamwidth relative to the level ground case is no more than about 0.1° and the effect on maximum EIRP spectral density is at most about 0.5 dB. Figure 15 illustrates the case of a 10° northward tilt, which has a smaller effect than a westward tilt.

Geo-Plane Beam Width:

Maximum Power Spectral Density (dBW/4KHz):

Figure 14. GSO-Plane Beamwidth and Maximum PSD at 14.25 GHz for ThinSat 300 Operating Tilted 10° Westward with a Satellite at 93° W

Geo-Plane Beam Width:

Maximum Power Spectral Density (dBW/4KHz):

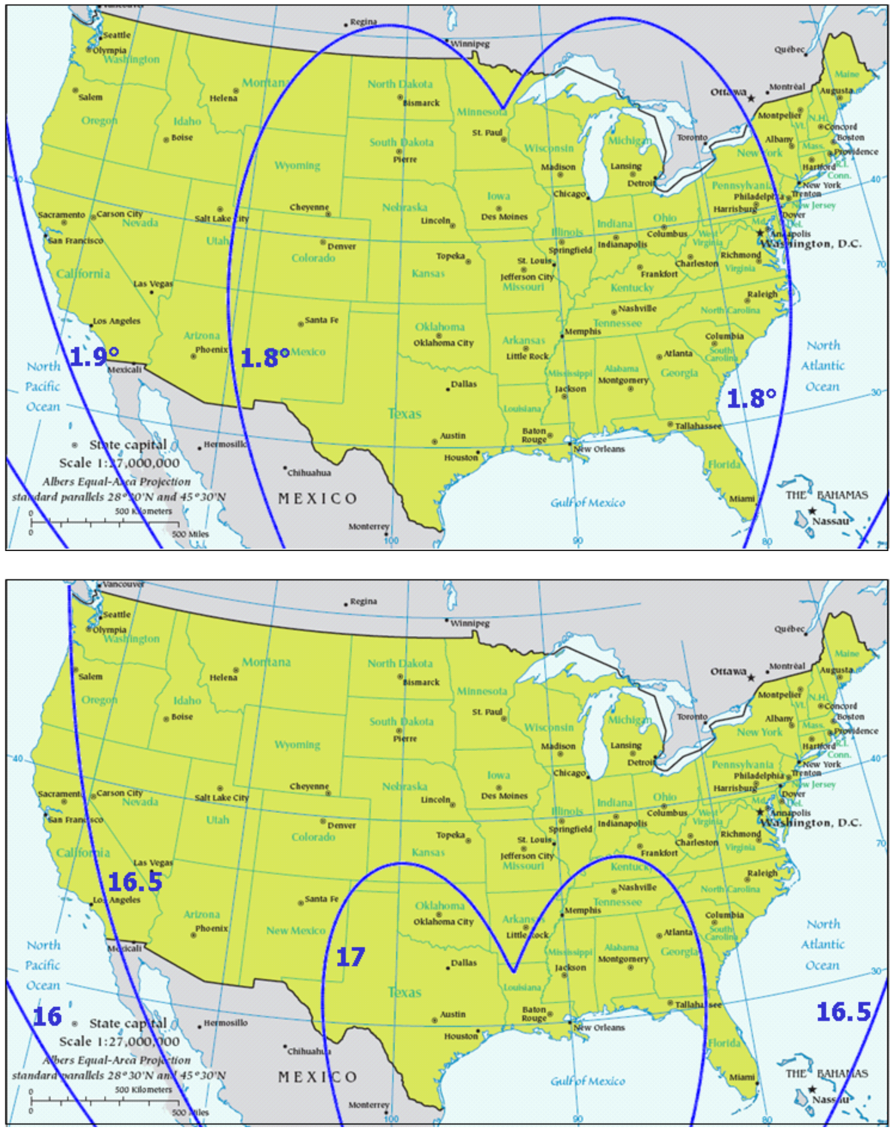

Figure 15. GSO-Plane Beamwidth and Maximum PSD at 14.25 GHz for ThinSat 300 Operating Tilted 10° Northward with a Satellite at 93° W

When the ThinSAT® 300 is operating, the location and tilt of the antenna system will be used to continuously update the maximum allowable EIRP spectral density that the unit can radiate. The location and tilt will be determined using the onboard GPS, accelerometers, and gyros. Since the maximum EIRP spectral density is a fairly slowly varying function of both location and orientation, accurate determination of its value is very straightforward and requires far less accuracy from the sensors than what is required to point the antenna. The gain of the antenna and the bandwidth and roll-off factor of the waveform will be used to determine the maximum allowable total power. The power monitor and step attenuator within the BUC, and the power output of the modem, will be used to ensure that under all conditions, the maximum permissible power level is not exceeded.

Polarization Control. VICTS antennas emit very pure linearly-polarized radiation (typically >40 dB cross-polarization isolation). For linear polarization applications, the polarization of the radiation is twisted to the proper orientation using a grid polarizer layer. The grid consists of a closely-spaced array of conductive traces which can be rotated independently of the rest of the antenna by a motor dedicated for this function.

Determination of the correct polarizer setting is straightforward. The grid layer is rotated so that its traces are orthogonal to the polarization (E-field vector) of the satellite. The GPS location and tilt of the antenna are used to calculate the appropriate grid rotation angle. The transmit and receive antennas of the ThinSAT®300 terminal each have their own polarizer so that their polarizations can be set independently.

Radiation Hazard Study. A Radiation Hazard Study regarding the ThinSAT®300 is included as Attachment 3.

C. Authorized Terminal Types - New Operating Characterization

The discussion at pages 18-23, *supra* (entitled "Power Control"), explains how the maximum permissible power level of the ThinSAT®300 terminal will be set based on the location and orientation of the terminal and the orbital location of the serving satellite. In summary, the maximum transmit power level will be calculated based on these factors (which affect antenna beamwidth) so that the permissible off-axis EIRP spectral density mask is never exceeded.

ThinKom also seeks authority to operate its other LMSS terminals in this manner rather than set a single maximum transmit power level applicable to all U.S. locations. The same factors that affect beamwidth and transmit power for the ThinSAT®300 terminal also affect ThinKom's previously authorized terminals. Thus, while ThinKom will increase the maximum transmit power for its other terminals to the "best case" rather than "worst case" level, these terminals will at all times comply with the Commission's two-degree spacing policies and associated of-axis EIRP spectral density limitations. Affording ThinKom such operational flexibility will ensure that terminals can operate at maximum efficiency and throughput without increasing the potential for interference to adjacent satellites.

In addition, as discussed at pages 7-8, *supra*, as an extra margin of protection and out of an abundance of caution, ThinKom will assume a pointing offset of 0.2° when setting maximum transmit power levels while the terminals are in motion. Thus, the maximum transmit power of the terminals will be reduced by an amount equal to that necessary to maintain compliance with the off-axis EIRP mask in Section 25.222 assuming the antenna is mispointed by 0.2°. This conservative approach will further ensure that there is no potential for harmful interference from ThinKom's limited experimental operations.

D. Protection of Other Users in the 14.0–14.5 GHz Band

The FCC has not yet established service rules applicable to VMES terminal operations, but interference considerations are analogous to those that currently apply to ESVs set forth in 47 C.F.R. § 25.222. As discussed above, ThinKom's terminals will operate in such a manner that the off-axis EIRP levels are no greater than the levels produced by routinely licensed VSAT earth stations. This is consistent with past FCC licensing conditions in the LMSS context. To the extent that any adjacent satellite operator experiences unacceptable interference from ThinKom's experimental operations, ThinKom will cease terminal transmissions immediately.

Protection of Potential NGSO FSS Systems. ThinKom acknowledges that non-geostationary orbit ("NGSO") systems are also permitted to operate in the Ku-band. However, no such systems are currently authorized or planned to operate within the period contemplated for the proposed experimental operations. To the extent such systems are ultimately deployed, ThinKom will coordinate with NGSO FSS licensees to protect their systems from harmful interference.

Protection of Terrestrial Wireless Services. ThinKom has examined current spectrum use in the 14.0-14.5 GHz band and has determined that there are no active FCC-licensed terrestrial services in this band in North America with which its proposed operations would potentially conflict.

Protection of the Radio Astronomy Service. For purposes of protecting radio astronomy sites, in the absence of a coordination agreement with the National Science Foundation, ThinKom terminals will not operate within line-of-sight vicinity of radio astronomy sites during observation periods.

Protection of Space Research Service. ThinKom recognizes the utilization of the frequency band from 14.0-14.05 GHz and the possible use of the band from 14.05-14.2 GHz allocated to the National Aeronautics and Space Administration ("NASA") Tracking and Data Relay Satellite System ("TDRSS") for space research conducted at White Sands, New Mexico and Blossom Point, Maryland. Consistent with 47 C.F.R. §25.222(d) and special condition 7 of its existing experimental license, ThinKom will cease transmit operations within 125 km of the operational facilities unless and until it reaches a coordination agreement with NASA permitting such operations.

IV. SATELLITE POINTS OF COMMUNICATION

ThinKom is currently authorized to continue to communicate with the following satellites: AMC 6 (72° W), Galaxy 26 (93° W), Horizons 1 (127° W) and G-10R (123° W). ThinKom seeks to eliminate Galaxy 26 and G-10R (which are being relocated), and add the following satellite points of communication: Galaxy 25 (93° W), Horizons 2 (74° W), Galaxy 18 (123° W), Galaxy 27 (129° W) and Galaxy 28 (89° W). Consistent with Special Condition 3 of its current authorization, ThinKom will obtain certification letters from the operators of these satellites confirming notification and providing points of contact, and submit them as part of the Commission's record.

Access to the proposed satellite points of communication is needed to test and demonstrate the ThinKom terminals for different applications, U.S. government and private entities, modem technologies and satellite service providers. Access to these satellites will provide ThinKom with the flexibility needed to conduct various test operations and demonstrations, and therefore is consistent with the public interest.

V. PROVISION OF SERVICE PURSUANT TO GOVERNMENT CONTRACT

Pursuant to Sections 5.3(b) and 5.63(b) of the Commission's Rules (47 C.F.R. §§ 5.3(b), 5.63(b)), ThinKom requests an expansion of the prior experimental authority to encompass operations that will be conducted pursuant to government contracts. ThinKom has received investment funding from In-Q-Tel (a strategic, not-for-profit investment firm that works to identify, adapt and deliver innovative technology solutions to the support the mission of the U.S. intelligence community). As part of the investment agreement, ThinKom is contractually obligated to provide In-Q-Tel with a number of ThinSAT®300 terminals for demonstration and testing purposes.[2] These and other demonstrations may result in further testing and evaluation contracts with the U.S. government.[3]

The Commission has authorized experimental operations in fulfillment of government contracts on countless occasions, necessarily finding that such experimental operations would serve the public interest.[4] In this case, the direct and substantial public benefits of the services provided under ThinKom's investment contract with In-Q-Tel and other potential government contracts are profound. The proposed experimental operations will afford several U.S. government agencies and the U.S. military the ability to evaluate ThinKom's broadband LMSS systems and services. These advanced communications capabilities will be available in the context of homeland security, public safety, intelligence gathering and other critical U.S. government applications. The need for U.S. government access to such advanced land-mobile communications services has never been clearer, particularly at this critical juncture in homeland security preparedness, disaster recovery and ongoing military operations overseas. Thus,

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2 In-Q-Tel's ongoing contract with the U.S. Government is #2004*H838109*000; ThinKom's subcontract is identified as "Thinkom Solutions 01". In-Q-Tel contacts with knowledge of ThinKom's activities on behalf of In-Q-Tel are Colter Carambio at (703) 248-3043 and Jim Smith at (703) 349-4207; In-Q-Tel, 2107 Wilson Blvd., Arlington, VA 22201.

3 In addition, ThinKom is under subcontract to Oceantronics for a Ku-Band SOTM demonstration. The Oceantronic contract with the U.S. Navy is #N00014-09-C-0067; the ThinKom subcontract for the manufacture of the 6" x 24" Ku-Band flatplate is #L-6018. Oceantronics may be contacted at 711 N. Nimitz Hwy., Honolulu, HI 96817, (808) 522-5600.

4 *See, e.g.,* Woods Hole Oceanographic Institution, Experimental Radio Station Construction Permit and License, Call Sign WA2XVB, File No. 6290-EX-PL-1998 (effective Dec. 21, 1998) (authorizing mobile satellite earth station operations required by the National Science Foundation, an independent agency of the U.S. government, in "oceans worldwide"); AT&T Corp., Call Sign WA2XFW (1997) (new experiment to test point-to-point communications between ships at sea to fulfill U.S. Navy contract); Lockheed Martin Corp., Call Sign WA2XGJ (1997) (new experiment to support U.S. Army contract); Westinghouse Comm. Services, Inc., Call Sign KG2XLV (1995) (new experimental for fulfillment of U.S. Navy contract); The Boeing Company, Call Sign WC2XVE (2002) (modified experimental license to permit provision of aeronautical mobile-satellite services to government users pursuant to U.S. Air Force contract).

authorizing ThinKom's experimental operations to provide critical communications services pursuant to a contract with the U.S. government plainly would serve the public interest.

VI. LIMITED MARKET STUDY AUTHORITY

ThinKom also seeks authorization to conduct limited market studies pursuant to Sections 5.3(j) and 5.93 of the Commission's Rules. 47 C.F.R. §§ 5.3(j), 5.93. ThinKom is in discussions with potential participants in limited trials of its mobile terminals, some of which are seeking market-test and operational data regarding terminal capabilities. In addition, ThinKom intends to use the limited market studies to demonstrate the potential uses and performance of its terminals, and to collect engineering and operational data regarding these uses.

Specifically, ThinKom proposes a limited market study designed to evaluate the commercial viability and usage characteristics of its land mobile terminals in various applications, including government vehicles, passenger vehicles and trains. Through the study, ThinKom seeks to obtain information regarding the frequency and duration of use in mobile and stationary modes, data rates achieved to and from each vehicle and aggregate data rates achieved in the network. ThinKom also seeks to validate the network's performance by collecting data relating to quality of service, including bit error rates, latency and possible degradation of service at the edge of service contours.

Consistent with Section 5.93(b) of the Commission's Rules, ThinKom will inform its trial partners and the users involved with testing that the land mobile service is being provided only on a test basis under an experimental authorization, is being offered only on a strictly temporary basis, and that ThinKom has not yet received Commission approval for the offering of a long-term commercial service. As noted previously, ThinKom intends to obtain such long-term authority subject to the final VMES licensing and service rules to be adopted by the Commission.

VII. REQUEST FOR EXPEDITED TREATMENT

ThinKom requests expedited treatment of this application for renewal due to the urgent need to test and demonstrate its products for In-Q-Tel to support the mission of the U.S. intelligence community, U.S. military and other potential government users. There is strong interest in operating ThinKom's terminals under the modified parameters described herein, which will enhance the performance and reliability of important land mobile communications capabilities needed by these and other users.

Additional information regarding the pressing need for the requested operations can be obtained by contacting:

Jim Smith
Vice President
In-Q-Tel
2107 Wilson Blvd.
Arlington, VA 22201
703-349-4207
jsmith@iqt.org

Grant of this application will serve the advanced communications needs of U.S. government agencies and military units, thereby enhancing their effectiveness and operational capabilities. Moreover, as demonstrated herein, ThinKom's proposed operations are fully consistent with the Commission's rules and policies to prevent harmful interference to other users of the spectrum. Thus, expedited action on this application is plainly consistent with the public interest.

VIII. THINKOM POINTS OF CONTACT

All tests and demonstrations will be conducted under ThinKom's supervision and control. The following ThinKom personnel have authority over all planned experimental operations and the ability to cease all operations. Either person may be contacted 24/7 at ThinKom headquarters or as noted below.

Greg Otto (primary) 639 14th Street Manhattan Beach, CA 90266 Mobile (310) 989-9117	Bill Henderson (secondary) 2805 190th Street Redondo Beach, CA 90278 Mobile (310) 347-2314

IX. CONCLUSION

The public interest will be served by the grant of a two-year renewal period for ThinKom's experimental license, Call Sign WE2XLJ, as well as grant of the requested changes to the authorization. ThinKom's line of "Comm-on-the-Move" antennas represent a significant advance forward in antenna technology, and further testing and demonstration of these terminals is necessary to facilitate introduction of this technology and bring the full benefit of broadband mobile communications to private and U.S. government users alike. In addition, ThinKom requests expedited processing of this renewal application due to the urgent demand for these antennas from U.S. government agencies and the military.

Mobile Broadband Communication Anytime...

ThinSAT®300 by ThinKom Solutions

Each ThinSAT®300 unit includes: transmit antenna, receive antenna, positioner, controller (with GPS), power supplies, LNB, block up converter (BUC) and environmentally sealed enclosure.

ThinKom's affordable, low-profile (4-1/4"), high data rate (up to > 10Mbps 2-way) highly efficient (no spreading required) and rugged vehicle roof-mounted Ku-Band Satellite Comm-On-The-Move (COTM) product provides continuous broadband connectivity (voice, video and data) at highway speeds without antenna deployment delays.

The ThinSAT®300 automatically acquires and tracks the desired satellite using open-loop and closed-loop tracking algorithms and interfaces to the users modem installed in the vehicle. Networking equipment can be added to create a mobile WiFi access point in-vehicle or 100's of feet around the vehicle.

The ThinSAT®300 is ideal for all applications including trains, satellite news gathering (SNG), recreation (motor homes, buses, vans, SUV's), enterprise (petroleum, insurance), military and federal, state and local emergency response teams that need to stay in constant communications without interruption. Also ideal for providing the backhaul for a mobile cellular (Femtocell) or WiMax network surrounding the response team vehicle.

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General Information

Weight: 95 lbs.

Size: 4-1/4" X 39" X 59-1/2"

Polarization: Selectable Linear (Dual T/R)

Transmit Band: 14.0-14.5 GHz (13.75-14.5 GHz band available)

Receive Band: 11.7-12.75 GHz (10.95-11.7 GHz band available)

G/T (mid-band): 12 dBi/K @ 70° elevation, 8 dBi/K @ 20° elevation

EIRP (mid-band w/internal 8W BUC): 45 dBw @ 70° elevation, 41 dBw @ 20° elevation

Acquisition and Track

Initial Acquisition: <60 seconds

Re-acquisition after 3 minute blockage: <1 sec.

Track Speed: >100 degree/sec and 100 degree/sec2 (Az and El)

Environmental

Operational Temperature: -30°C to +55°C

Storage Temperature: -40°C to +70°C

Humidity: up to 100% condensing

Altitude: operational to 10,000 feet and non-operational to 40,000 feet

Max. Vehicle Speed: 100+ MPH

Mounting Specifications

Vehicle Rack Range: 36” to 44"

Supports horizontal, vertical and internal installations

Voltage / Power

Unit Voltage: 12 VDC @ 150W-450W depending on selected BUC

Cabling

Transmit (Tx): coax N-type 75 ohm

Receive (Rx): coax N-type 75 ohm

Electrical Data Interface: RJ45 ethernet

Power

Controller

Controller integrated into unit

BUC

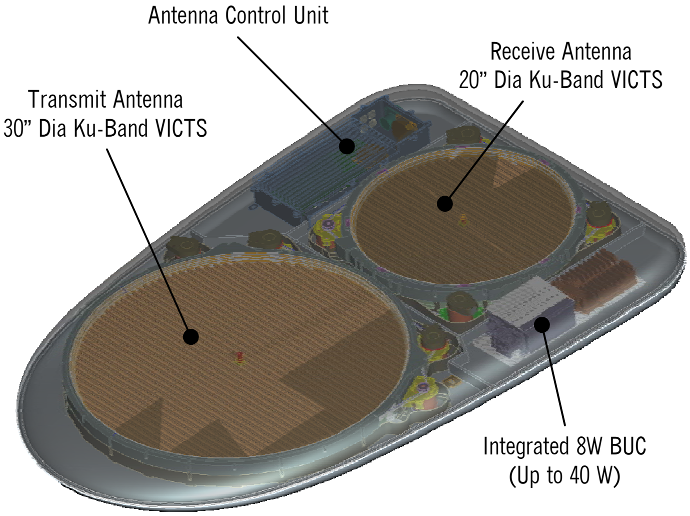
8W standard; also available 16, 25 and 40W

Features and Benefits

- Low-profile (4-1/4” high) and highly efficient
- Auto-acquires and tracks the desired satellite
- ThinSAT®300 interfaces with the vehicle installed modem (modem not included) and operates with most modems
- Compatible with any Ku-Band satellite
- FCC 25.222 compliant—spreading not required
- Integrated antenna controller and 8W BUC (16-25-40W internal BUCs also available)

Applications

- High speed Comm-on-the-Move (COTM) for federal, state and local first responders
- High speed COTM for federal, state and local law enforcement security/Intel, and Homeland Security
- High speed COTM for trains and commercial enterprise activities
- High speed broadband for mobile industrial applications; oil and gas, insurance, utilities, transportation, etc.
- High speed COTM connection for military (e.g.; logistics)
- High speed communication link for news gathering and reporting organizations
- High speed broadband internet for motor homes, buses, vans and SUV’s



ThinSAT®300

thinkom

20000 Mariner Avenue, Suite 500
Torrance, California 90503 USA
310.371.5486 (T) 310.214.1066 (F)
Website: http://www.thin-kom.com

Attachment #2: ThinKom's Application for Renewal of Experimental Authority: WE2XLJ

Emmission Designator	Frequency (GHz)	Polarization	EIRP Spectral Density (dBW/4KHz)	Gain (dBi) (Measured @ Flange)	Flange Power (Watts)	Radiated Power (Watts)	EIRP (dBw)	ERP (dBW)	Bandwidth (kHz)	Modulation
7M14G7W	14-14.5	H/V	16.8	33	40.0	31.8	49.0	46.9	6660	PSK
11M3G7W	14-14.5	H/V	16.8	35	40.0	31.8	51.0	48.9	10570	PSK
31M9G7W	14-14.5	H/V	12	35	40.0	31.8	51.0	48.9	31920	PSK
4M29G7W	14-14.5	H/V	16.8	33	25.7	20.4	47.1	45.0	4290	PSK
4M29G7W	14-14.5	H/V	16.8	35	16.2	12.9	47.1	45.0	4290	PSK
2K60G7W	14-14.5	H/V	16.8	33	1.6	1.2	34.9	32.8	260	PSK
2M60G7W	14-14.5	H/V	16.8	35	1.0	0.8	34.9	32.8	260	PSK

Notes: The first two examples (lines 1 and 2) show the maximum spectrum density (16.8 dBW/4 kHz) that can be radiated and the maximum total power that can be radiated using the largest internal BUC for the ThinSAT®300. The difference between the first and second examples is that the first one corresponds to a satellite that is low on the horizon and the antenna gain is therefore relatively low, 33 dBi. In the second example, the satellite is at a higher elevation and the gain is 35 dBi. Also, in the second example, the bandwidth is greater as the larger antenna gain enables the ThinSAT®300 to obtain the 16.8 dBW/4kHz spectral density over a larger frequency range.

In the third example (line 3), the bandwidth is maximized by reducing the EIRP spectral density. This example covers cases where there is a very good satellite footprint and the desire is to maximize the data rate. The next two examples (lines 4 and 5), represent how the ThinSAT®300 would operate when transmitting at a 2 Mbps data rate at two different satellite elevations. Finally, the last two examples (lines 6 and 7) illustrate the narrowest band transmissions that are expected for two different satellite elevations.

Attachment #3: ThinKom's Application for Renewal of Experimental Authority: WE2XLJ

Radiation Hazard Analysis for the ThinSat®300

This report analyzes the non-ionizing radiation levels for ThinKom's ThinSat®300 antenna. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure -- the General Population/Uncontrolled Environment and the Controlled Environment, where the general population does not have access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of 5 milliwatts per square centimeter (5 mW/cm2) averaged over any 6 minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 1 milliwatt per square centimeter (1 mW/cm^2) averaged over any 30 minute period in a uncontrolled environment.

Near Field Exposure

The relevant basic parameters of the antenna are given in Table 1. The radiating area of the aperture is approximately 355 square inches. Minimal tapered is employed in the design, so for the purpose of this analysis the power density over this area can be assumed to be uniform. The largest power amplifier that the ThinSat®300 will be equipped with is 40 W. There is approximately 1 dB loss between the power amplifier and the aperture. This implies a radiated power of 32 Watts. This value was assumed for all of the analysis shown in this document.

32 Watts distributed over an area of 355 square inches implies a power density of just under 14 mW/cm^2. Therefore, in the near field of the aperture, the radiation emitted from the ThinSat®300 can exceed the MPE limits.

Exposure in the Transition Region and Far Field

In the far field the power density at the peak of the main beam is given by:

$$\text{(1)} \qquad \text{Max Power Density} = \frac{P_{tot} * \text{Dir}}{4\pi * \text{Dist}^2}$$

Where P_{tot} is the total power radiated, Dir is the antenna's directivity, and Dist is the distance from the aperture.

In the transition region the peak power density is given approximately by:

$$\text{(2)} \qquad \text{Max Power Density} = \frac{P_{tot}}{\pi * (R+2*Dir^{-1/2}Dist)^2}$$

Where R is an effective radius of the antenna (defined by πR^2 = Aperture Area). Note that when Dist is much greater than the antenna radius, the R in the denominator can be neglected and this equation becomes equal to the far-field expression given above. Also, when the Dist is equal to zero, this equation gives the correct near-field value (= P_{tot}/Area).

Since the VICTS architecture employed by the ThinSat 300 antenna is essentially a mechanically scanned phased array antenna, its directivity varies with scan angle. As shown below in Table 1, the antenna's directivity is given approximately by 37 dBi + 10log(cos(Scan Angle)), where the scan angle is the angle of the main beam with respect to mechanical boresight.

Frequency (GHz)	14.25
Directivity (dBi)	37 + 10log(cos(Scan Angle))
Loss (dB)	1.0
Input Power (Watts)	40.0
Radiated Power (Watts)	31.8
EIRP (dBW)	52 + 10log(cos(Scan Angle))
Aperture Area (in^2)	355.0

Table 1: ThinSat®300 Technical Parameters

These values were employed with equation (2) to calculate the power density values given in Table 2, below. When the beam is scanned to boresight, the power density falls below the permissible levels for controlled and uncontrolled environments at distances of 27 and 6.5 meters, respectively. For the case of a 75 deg. scan angle (the greatest scan angle that the antenna will employ), the power density falls below the permissible levels at distances of 15 and 3.5 meters.

	Scan Angle (Degrees From Boresight)				
Distance (meters)	0.00	30.00	45.00	60.00	75.00
0.5	12.6	12.5	12.3	12.1	11.5
1	11.4	11.3	11.0	10.6	9.6
2	9.6	9.3	9.0	8.4	7.1
3	8.1	7.9	7.5	6.8	5.4
4	7.0	6.7	6.3	5.6	4.3
5	6.1	5.8	5.4	4.7	3.5
10	3.4	3.2	2.8	2.3	1.5
15	2.2	2.0	1.8	1.4	0.9
20	1.5	1.4	1.2	0.9	0.6
30	0.8	0.8	0.6	0.5	0.3

Table 2 Maximum Power density (in mW/cm^2) at various distances and scan angles when the ThinSat®300 is operated with a 40 power amplifier

The ThinSat®300 will be deployed on the top of vehicles or buildings (for test purposes). Antenna boresight will be directed at or near zenith. Therefore the radiation will be mainly confined to areas that are typically not easily accessible to the general population. It should also be noted that the ThinSat®300 does not suffer from the spillover phenomena (that occurs with reflector antennas). Therefore, the radiation levels will be extremely low in areas below the level at which the antenna is mounted. This is quantified in Figures 1-5, below. The figures show approximate predicted normalized elevation patterns, "as seen" at various distances from the antenna for different scan angles. The analysis used to generate the patterns is valid from boresight to 90 deg. from boresight (zenith to horizon assuming the antenna is pointed straight up). At angles more than 90 deg. from boresight, the radiation is further suppressed. The analysis does not take into account the fact that the antenna enclosure will also help reduce near and below horizon radiation.

As indicated in the figures that follow, radiation in regions below the level of antenna will typically be very low, even at small distances. For the (worst) case of a 75 deg. scan angle, the on horizon radiation level is (at least) 8 dB below the value for the main beam. Since the peak radiation value at a distance 1 meter from the antenna for this scan angle is about 10 mW/cm^2, at or below the level of the antenna the power density is at most 1.5 mW/cm^2 at this distance. Below the level of the antenna and inside the vehicle, any potential radiation exposure will falls well below permissible levels and indeed would be difficult to measure given its negligible value.

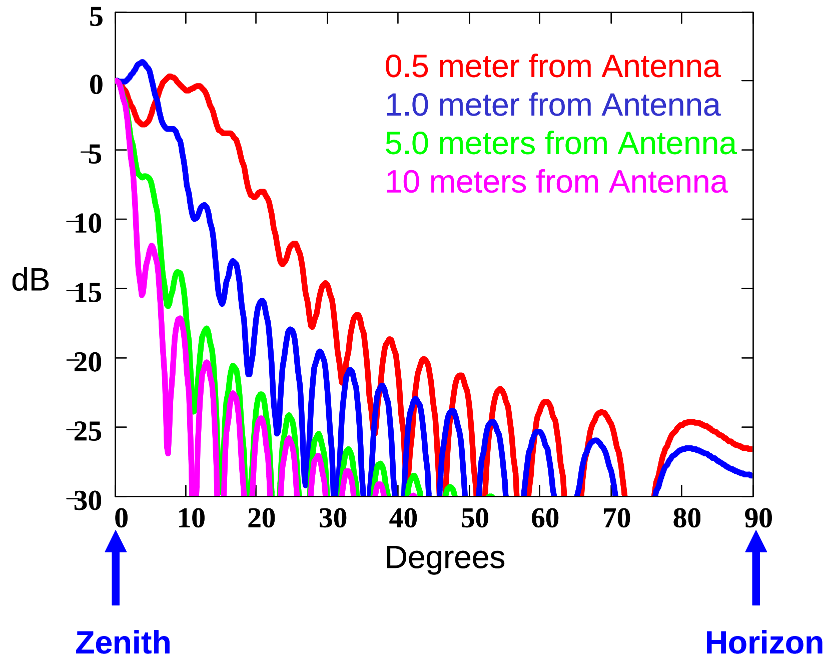


Figure 1 Elevation Radiation Patterns at variation distances from the Antenna when the beam is scanned to boresight

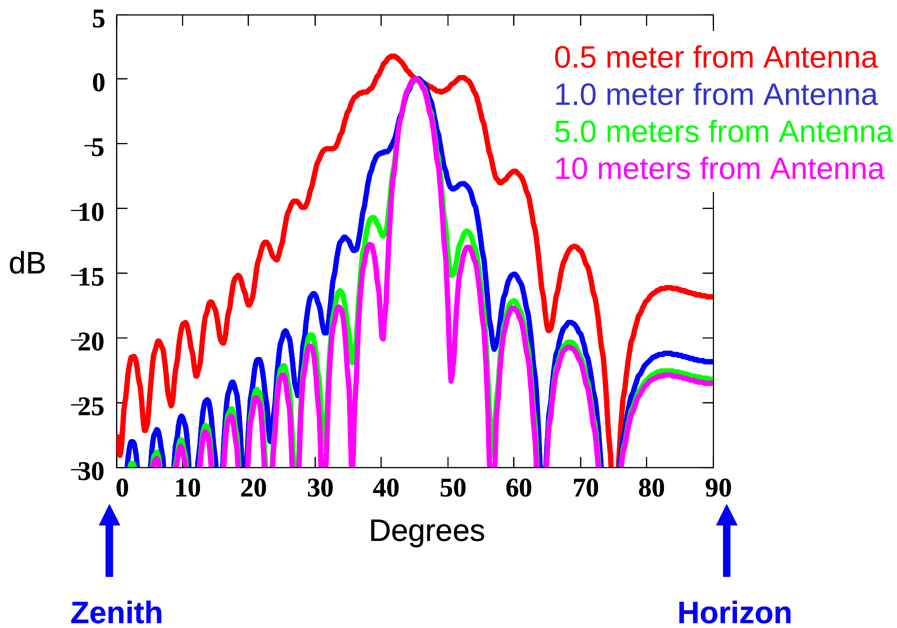


Figure 2 Elevation Radiation Patterns at variation distances from the Antenna when the beam is scanned to 45 degrees from boresight

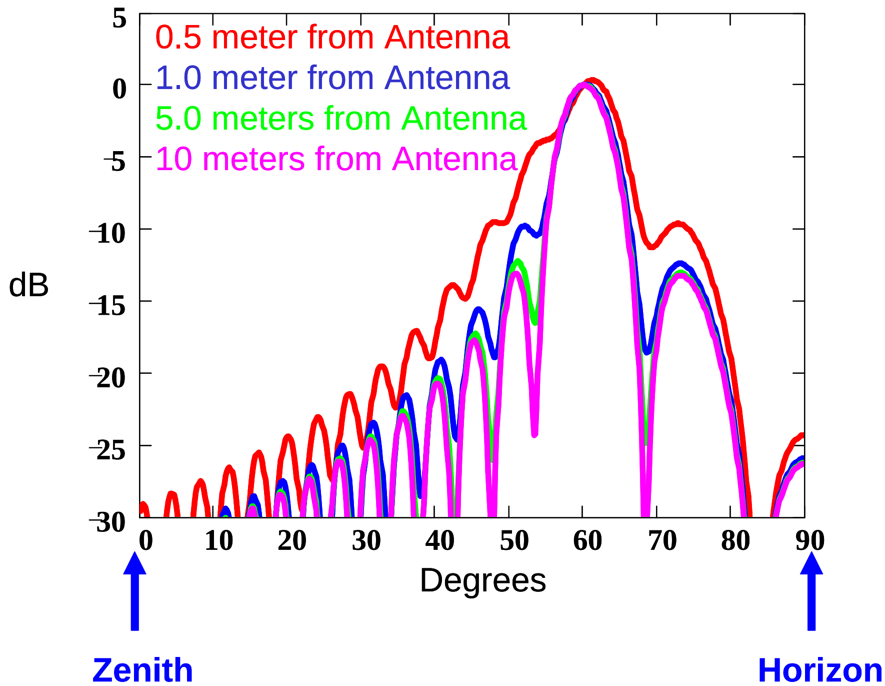


Figure 3 Elevation Radiation Patterns at variation distances from the Antenna when the beam is scanned to 60 degrees from boresight

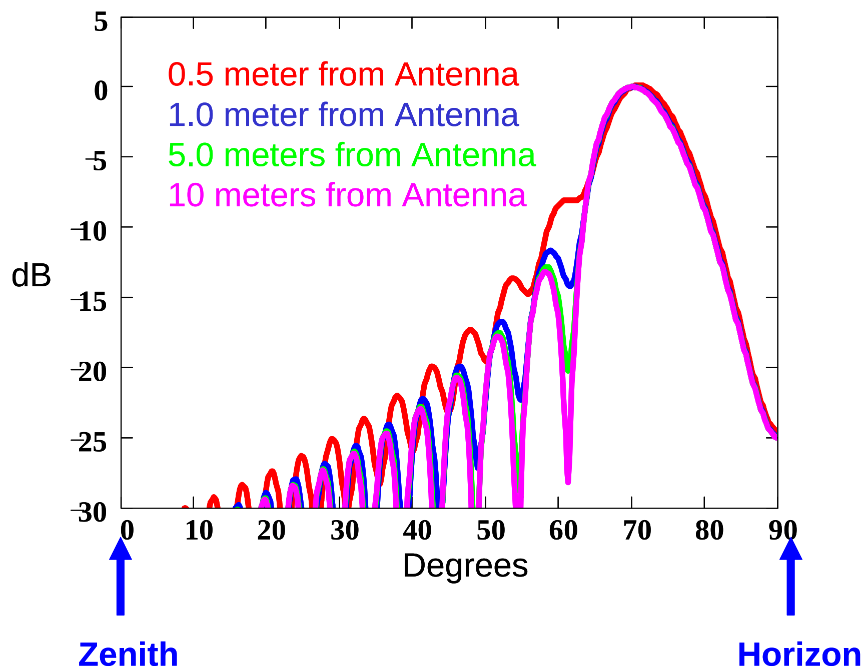


Figure 4 Elevation Radiation Patterns at variation distances from the Antenna when the beam is scanned to 70 degrees from boresight

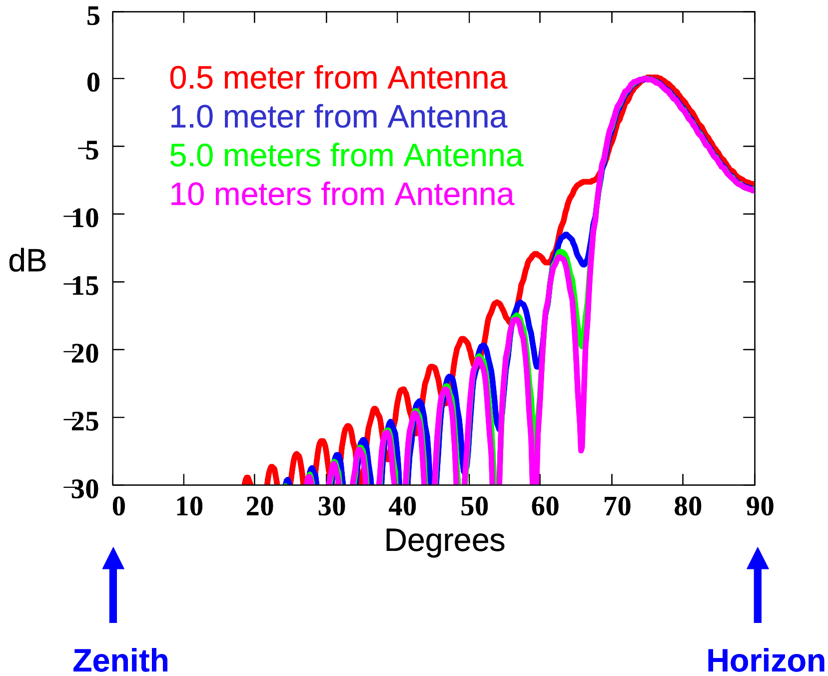


Figure 5 Elevation Radiation Patterns at variation distances from the Antenna when the beam is scanned to 75 degrees from boresight

Conclusion

In the case of the proposed operations, the main beam of the antenna will not be aligned with any uncontrolled area since experiments will be carefully monitored and limited in time, the antenna will be mounted on a building or vehicle rooftop, and transmit operations will only be conducted with a clear field of view toward the serving satellite. Thus, the applicable General Population/Uncontrolled Exposure limits will be not exceeded under ordinary test conditions.

All testing and demonstrations of the ThinSat®300 will be conducted only by trained personnel in Controlled Environments. By maintaining a safety distance of along the antenna main beam during transmit operations, which can only be accessed by trained personnel, it can be guaranteed that the Controlled Environment exposure limits will not be exceeded under any test conditions.

Importantly, to the extent an antenna mounted on a moving vehicle is temporarily and inadvertently directed toward an uncontrolled environment (e.g., an intervening bridge or building), the antenna will lose satellite lock and cease transmitting immediately. This further ensures that RF radiation exposure limits will be not exceeded.

A warning label will also be affixed to the antenna warning individuals to avoid the area above and around the antenna radome during transmit operations. Finally, antenna roll-off and antenna housing/rooftop attenuation ensure that individuals below antenna level, including passengers inside a vehicle equipped with the ThinSat®300, will not be exposed to impermissible levels of RF radiation.